Update on SMOS

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and the SMOS L2 OS Team

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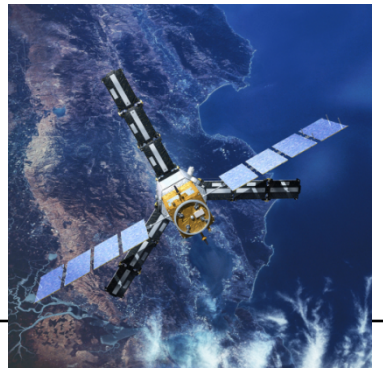
(presented by Alfredo L. Aretxabaleta)

SMOS SSS mission requirements

Overall SMOS scientific goal

To provide global coverage of Sea Surface Salinity fields, with repetition rate and accuracy adequate for oceanographic, climatological and hydrological studies and increase the present knowledge on:

- **Large-scale ocean circulation**
- **Water cycle exchange rates quantitative estimation**
- **Occurrence of natural catastrophic events**
- **Management of water resources**
- **Role of the ocean in the climate system**



- The multiangular measurements of any point on the Earth's surface provided by the SMOS interferometric radiometer MIRAS at each satellite overpass are aimed at:

  – Determining sea surface salinity with an accuracy of the order of 0.1 practical salinity units, 100 – 200 km spatial resolution and 10 – 30 days temporal resolution

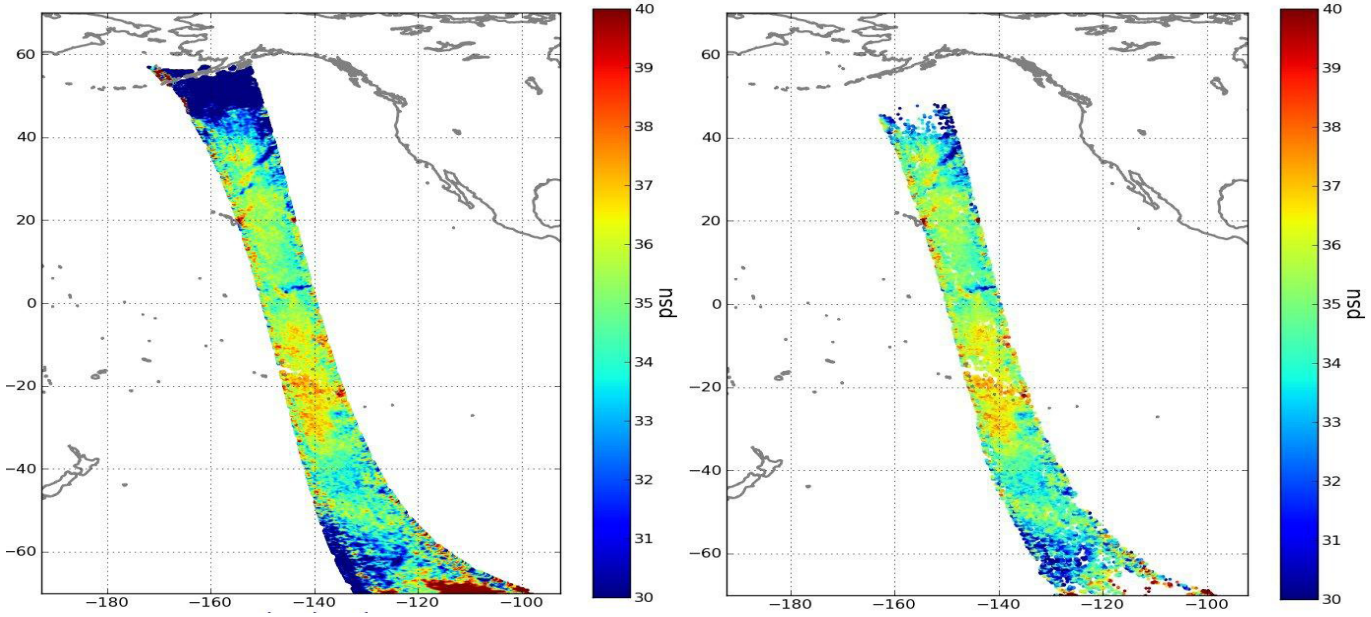
SMOS information

- SMOS launch: November 2, 2009
- Operations phase with full polarization mode: from May 20, 2010
- First general reprocessing: summer 2011
- Field-of-view: 1000 km
- Pixel size: 30-90 km
- Incidence angle: 0-60º
- Earth full coverage: 3 days
- Level 1 and Level 2 (semi-orbits) provided by ESA to registered PIs
  - Expected L2 accuracy: 1-2 psu range, function of distance to track, depending on environmental variables (temperature, wind)
- Level 3 gridded maps provided by Spain (CP34) and France (CATDS)
  - Aimed at fulfilling mission requirements through noise reduction by averaging
  - CP34 registration http://www.cp34-users.cmima.csic.es/
  - CP34 provision of NetCDF files http://tarod.cmima.csic.es
  - CATDS information http://www.cesbio.ups-tlse.fr/fr/smos/smos_catds.html

The SMOS L2 OS processor

Developed by the SMOS L2 OS team and implemented by ACRI-ST, Fr and Argans Ltd., UK

Last version 3.17, to be operational early March 2011
Includes first modifications using models fit to SMOS data

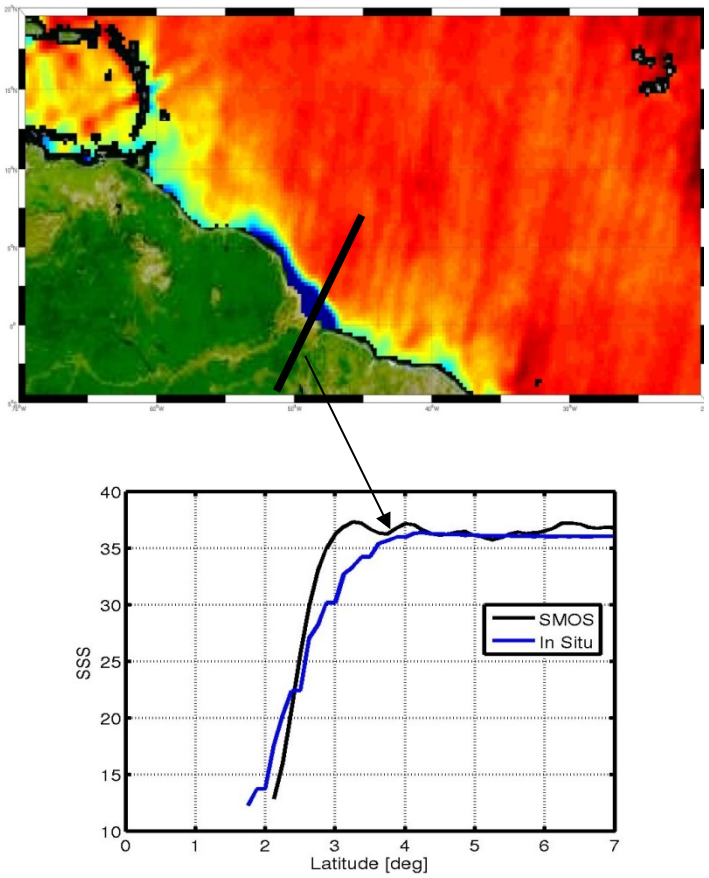


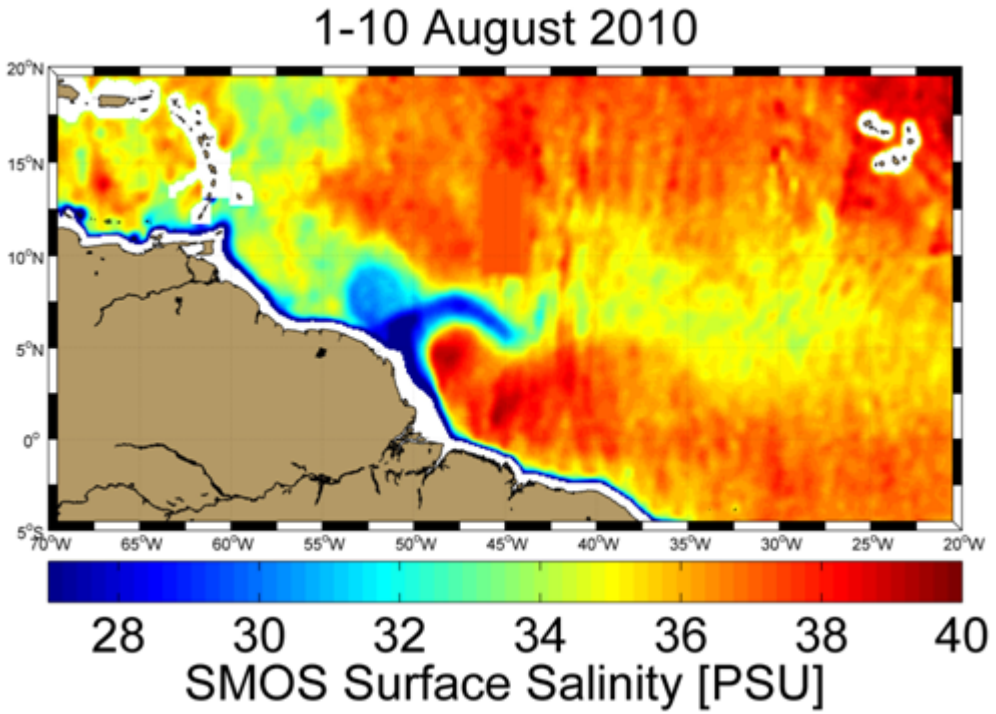
Retrieved SSS along a SMOS ascending orbit in the Pacific Ocean.
Unfiltered (left) and filtered (right, removing flagged data) values

L2OS processor performance

Good to detect strong SSS gradients: the Amazon plume

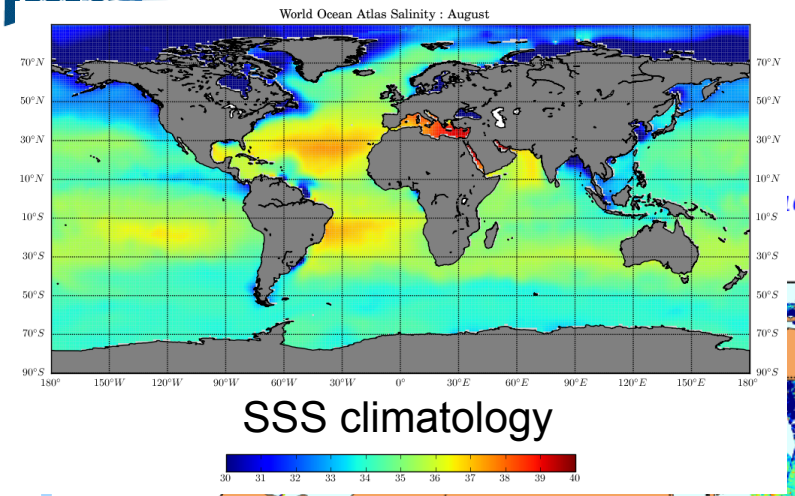
SMOS descending orbits, March 2010



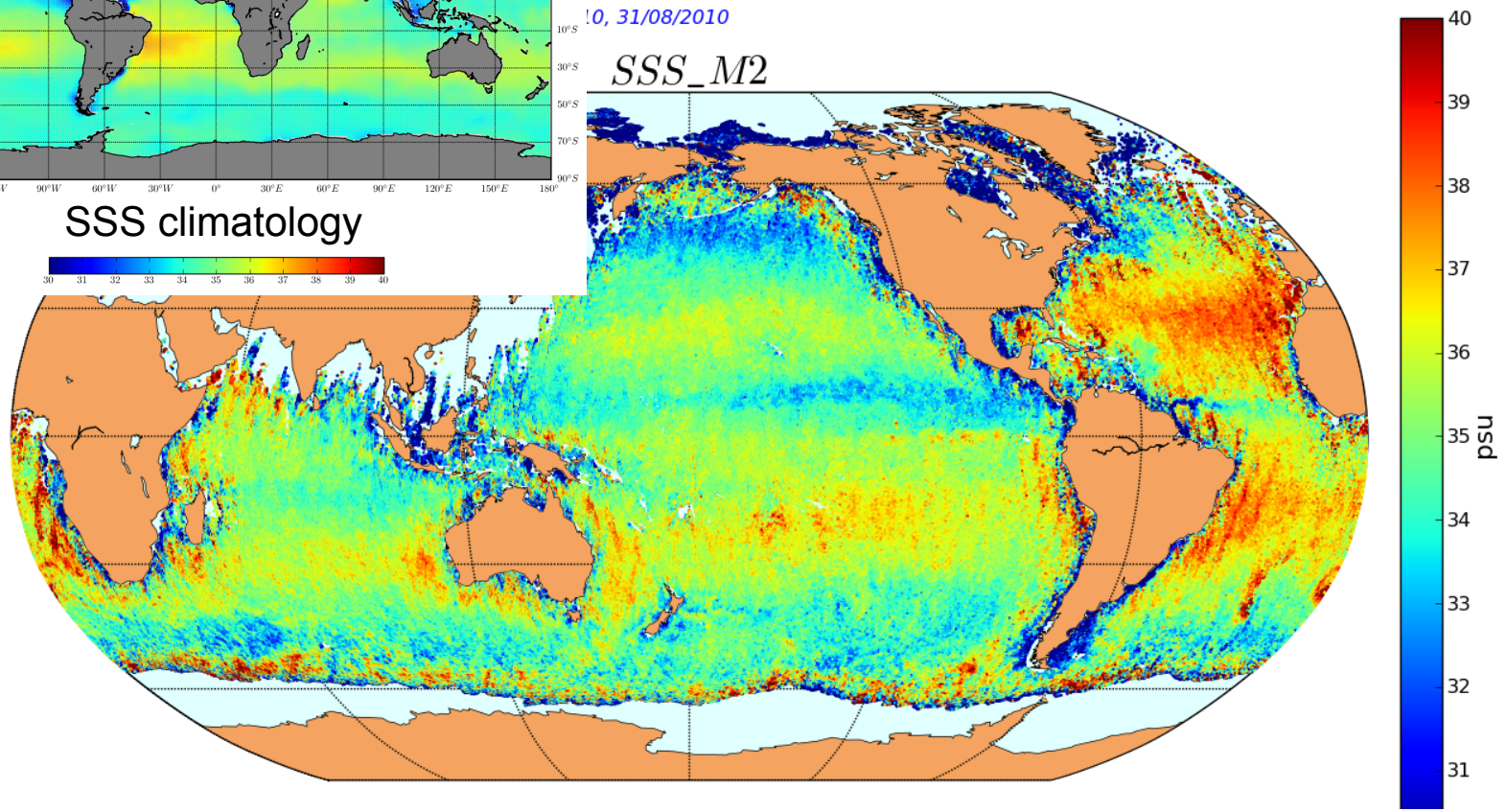


by N. Reul, IFREMER, Brest

SSS maps from L2OS processor



Looks good,
but not meeting requirements yet

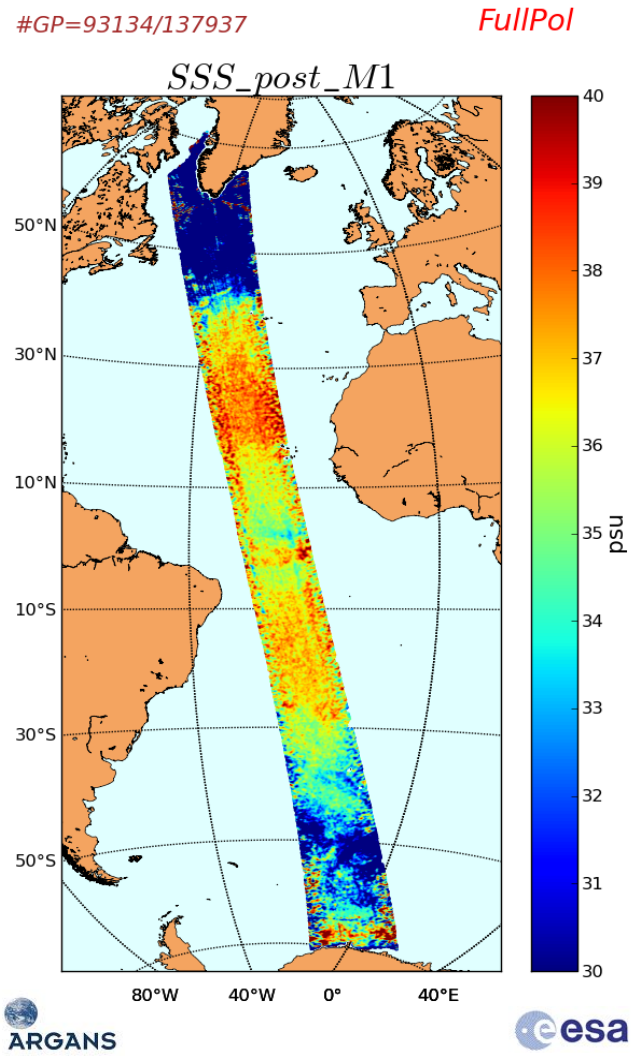


5 day average SSS, 30 August – 3 September 2010

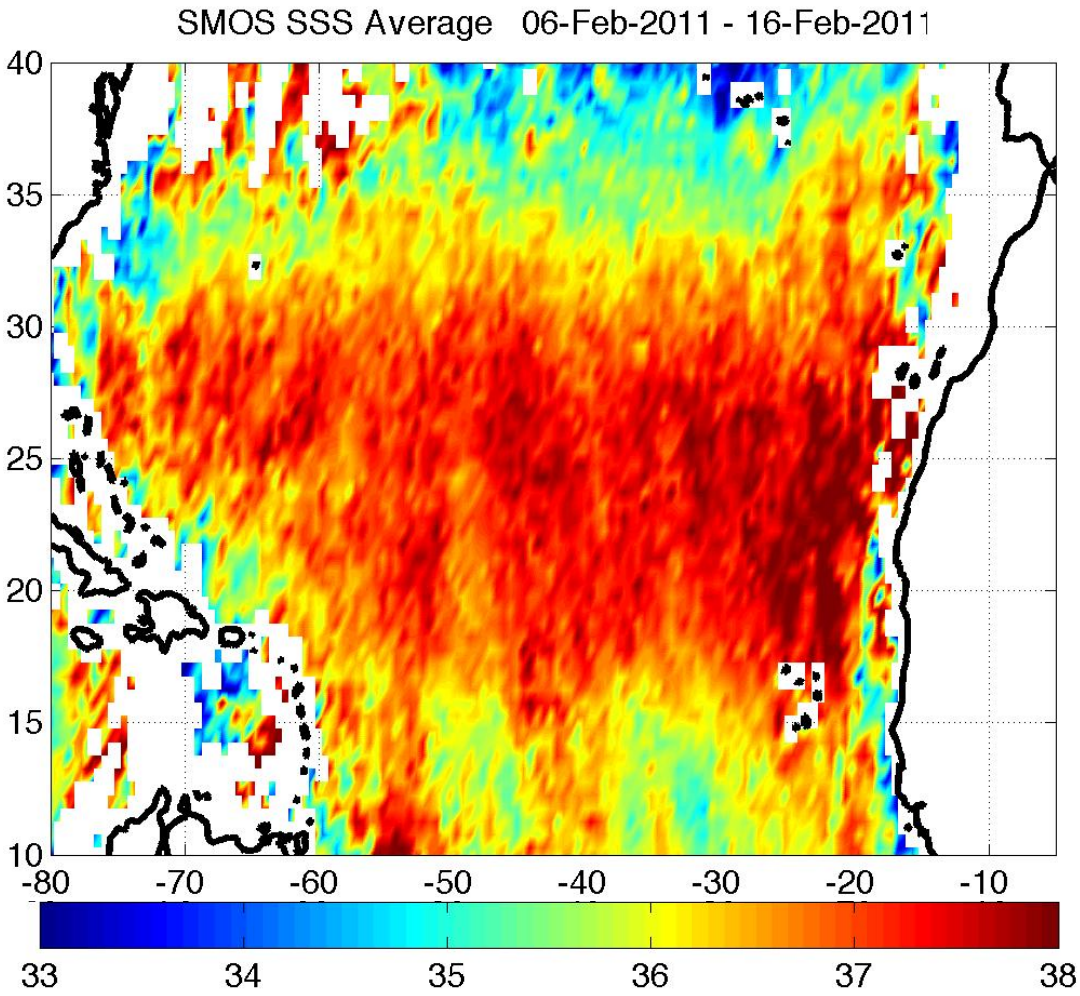
by P. Spurgeon & A. Chuprin, Argans Ltd., Plymouth

SSS maps in SPURS area

L2 (semi-orbit) 21- Feb-2011



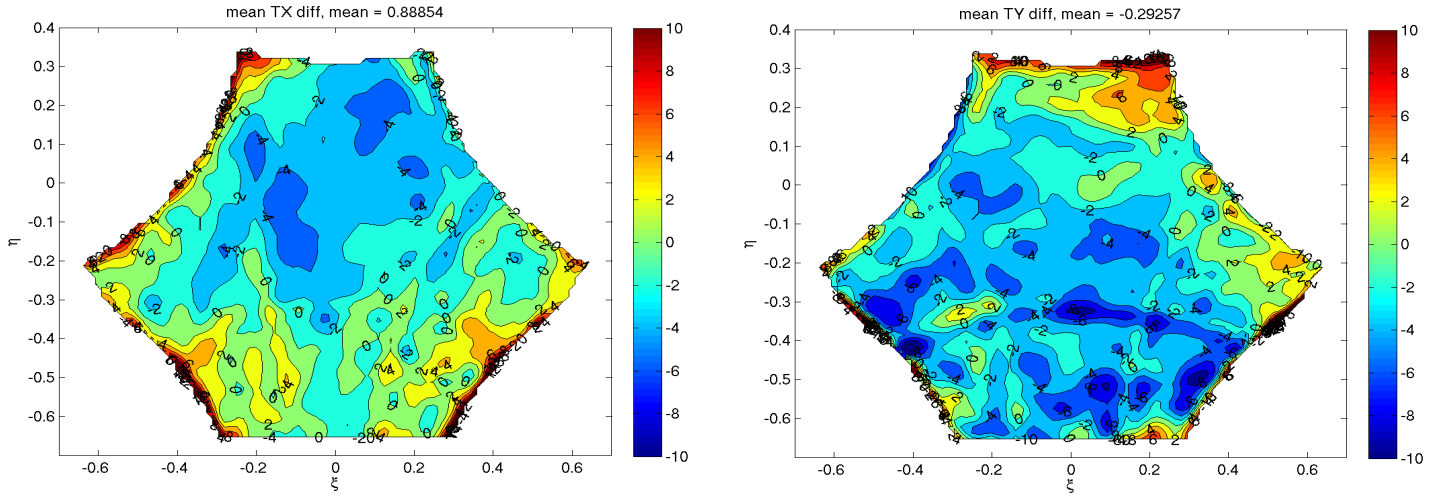
L3 maps



by A. Aretxabaleta, J. Martinez
SMOS-BEC, Barcelona

Main problems in SSS retrieval

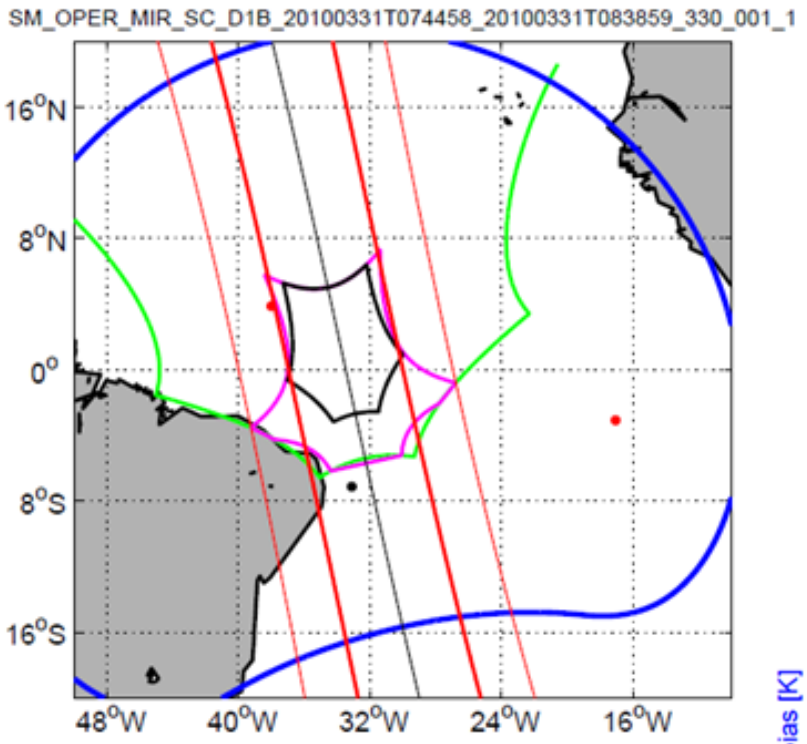
- Bias in the comparison of measured and modeled Tb

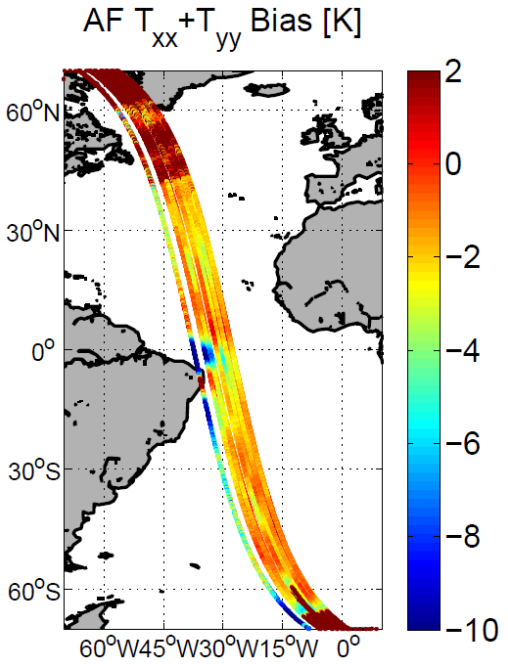


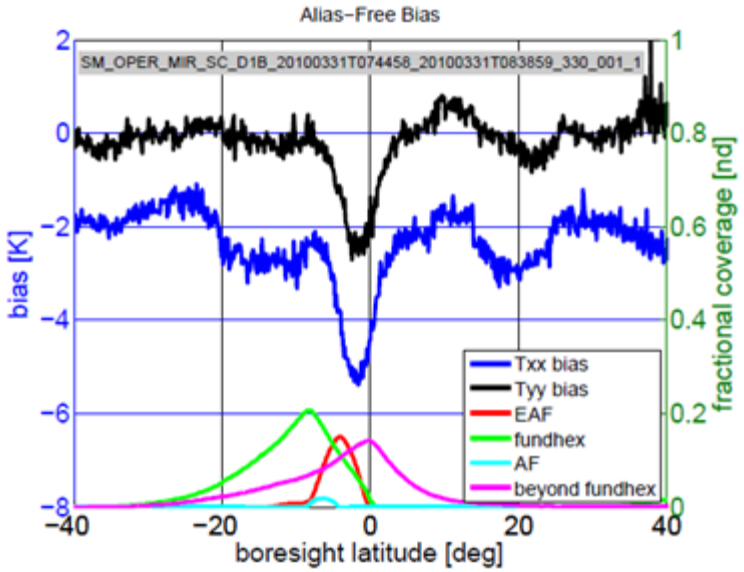
  - Spatial pattern persistent along and in different orbits
  - Similar using different ocean emissivity models: related to instrument and image reconstruction imperfections
  - Removal techniques being tested: additive Ocean Target Transformation (mean residual bias over homogeneous ocean areas) now implemented in L2OP
  - Other approaches under analysis

Main problems in SSS retrieval

- Impact of land on Tb bias patterns



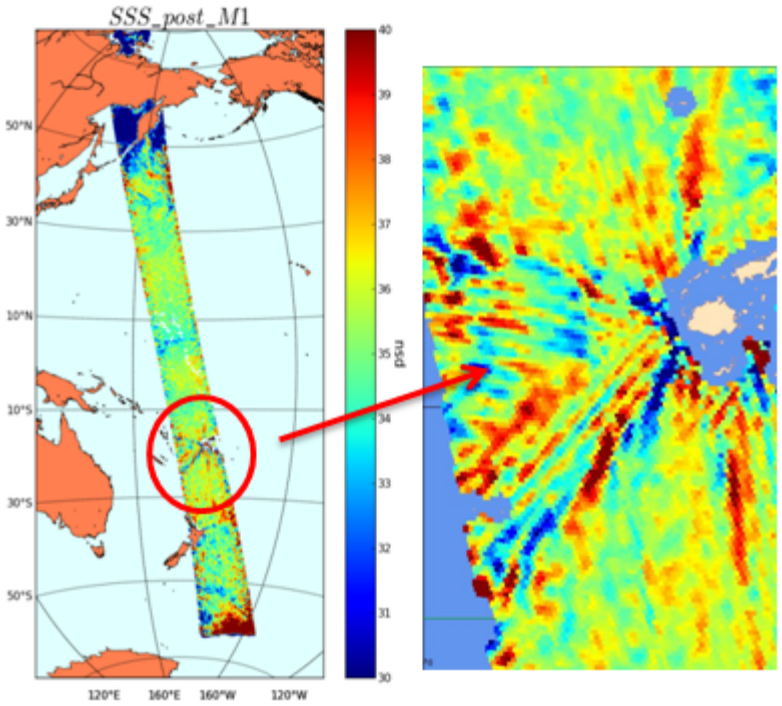




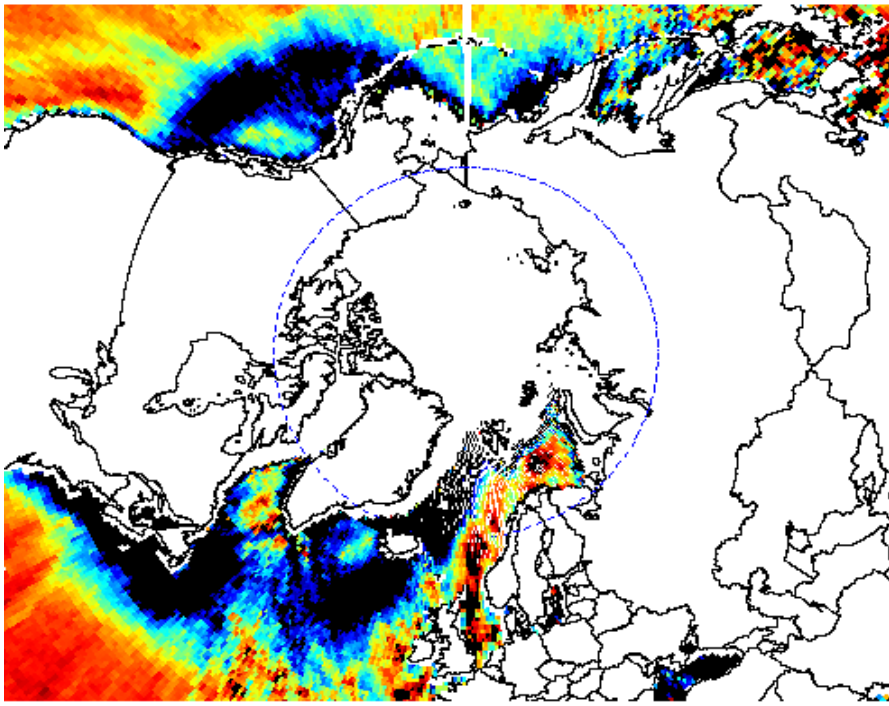
by J. Tenerelli & N. Reul

Main problems in SSS retrieval

- Contamination from radio frequency interferences (RFI)



Fiji islands, Jul 2010

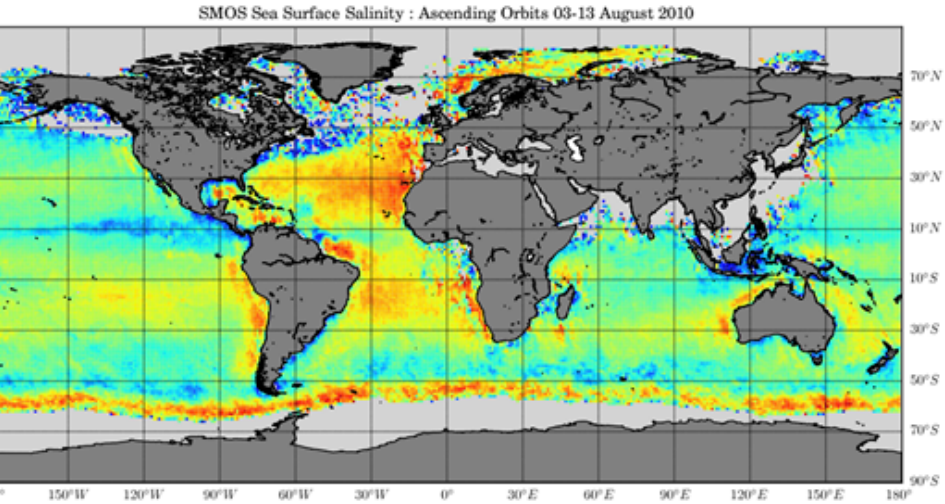


by N. Reul

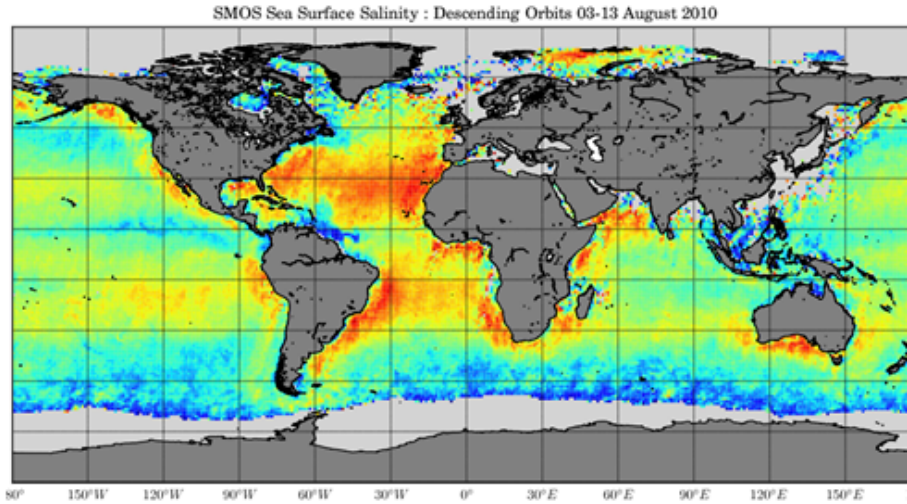
Point sources or large areas affected by extended sources

Main problems in SSS retrieval

- Asymmetry ascending-descending passes



SMOS SSS ascending August 2010



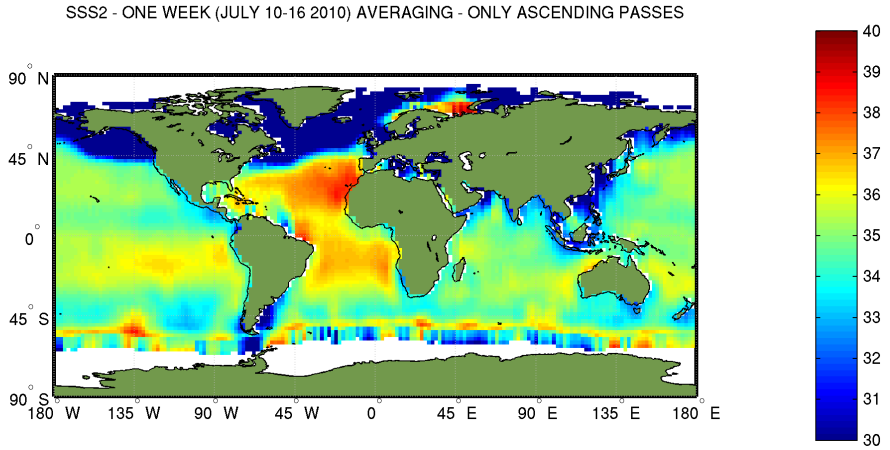
SMOS SSS descending August 2010

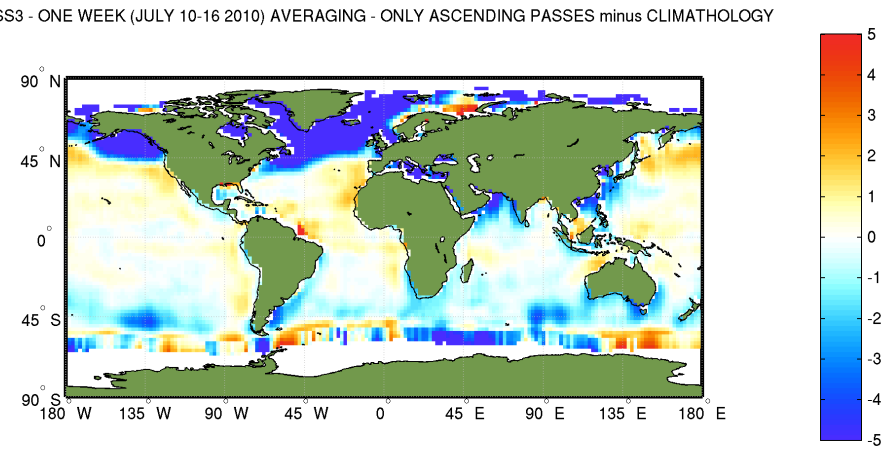
by J. Boutin, LOCEAN, Paris

- Different land contamination impact
- Different sun position with respect to spacecraft
- Different galactic noise reflection

Main problems in SSS retrieval

- Roughness correction models to be improved
  - Three options implemented in SMOS L2OS processor
  - Models fail at high winds



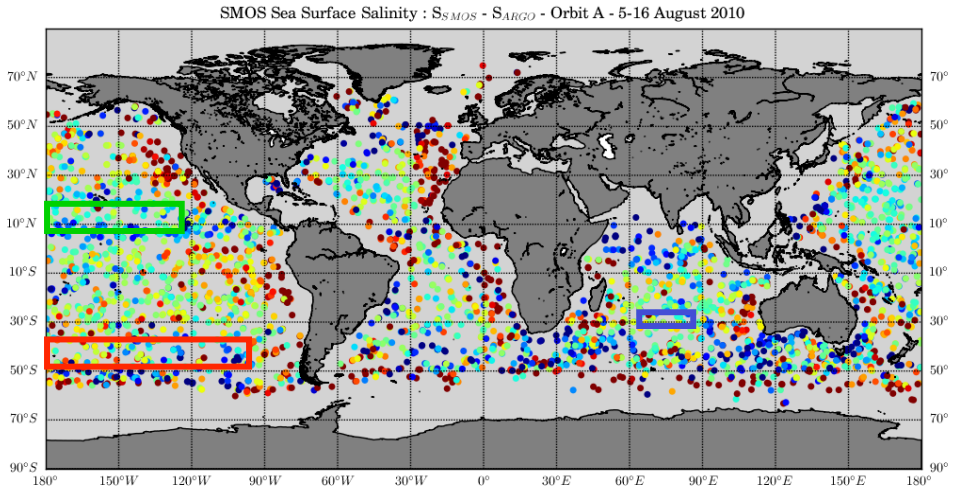


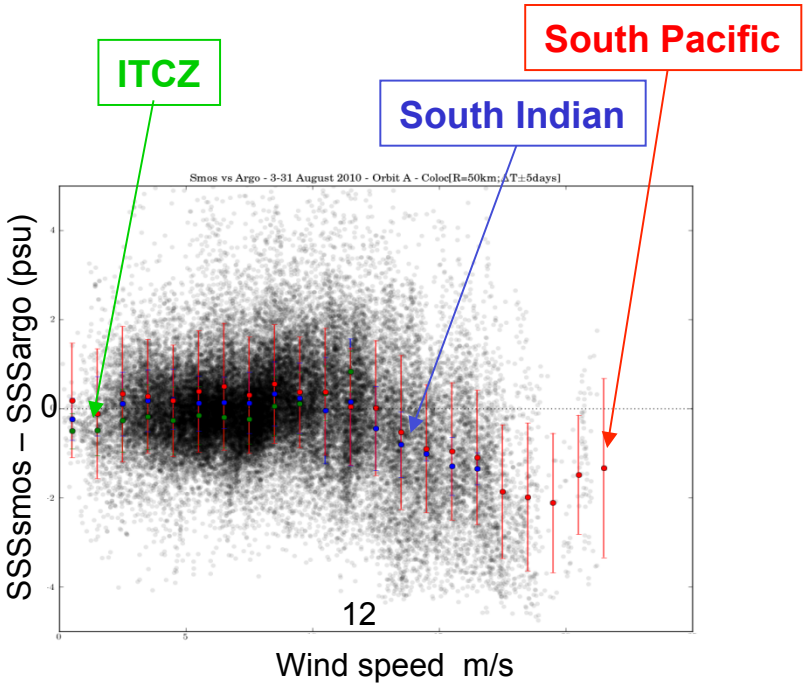
Weekly global salinity map, July 2010; left: weighted averaging + discarding flagged data, right: difference with climatology

by M. Talone & R. Sabia, SMOS-BEC, Barcelona

Using ARGO for model improvement

SSS SMOS – ARGO collocations show performance of roughness correction models in ranges of wind speed



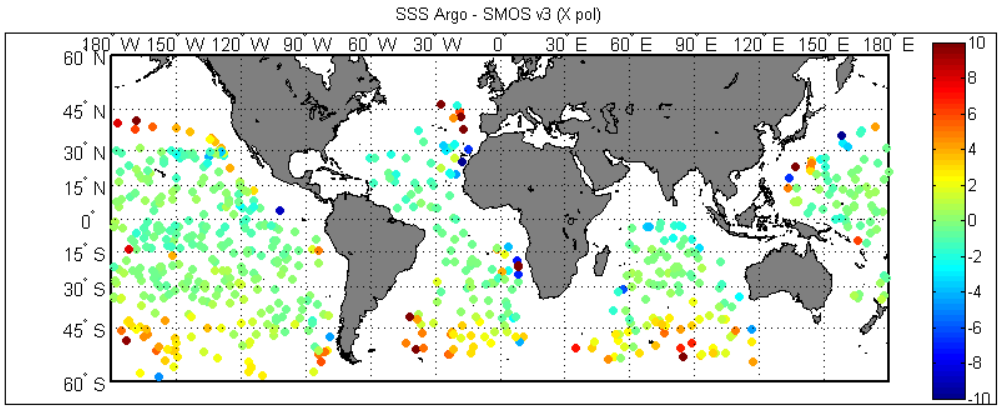


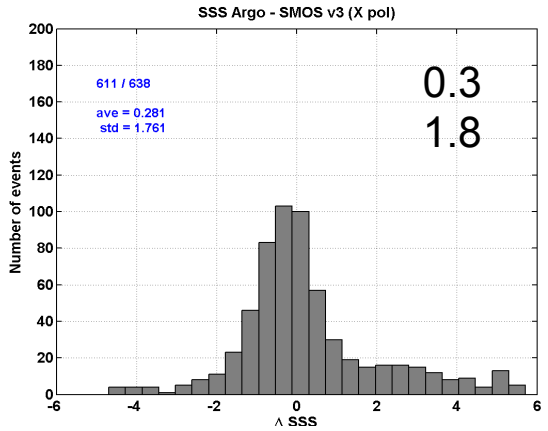
Possibility of improving theoretical roughness models by adjusting parameters to fit the data

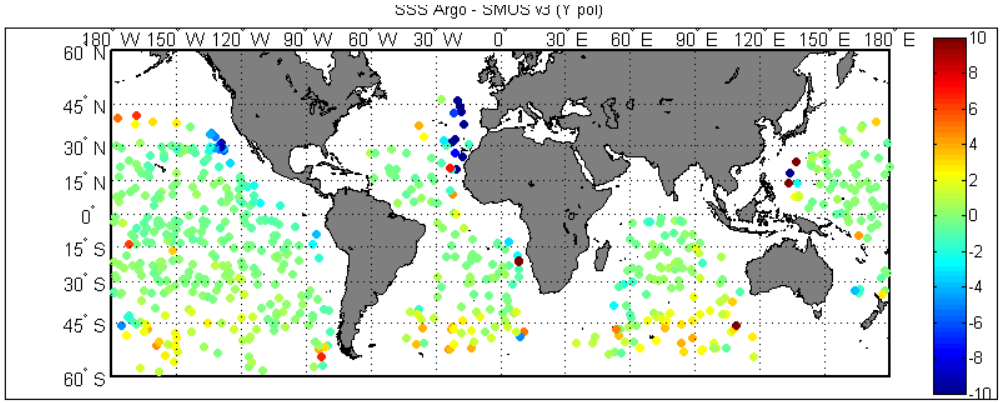
by J. Boutin, X. Yin, LOCEAN, Paris

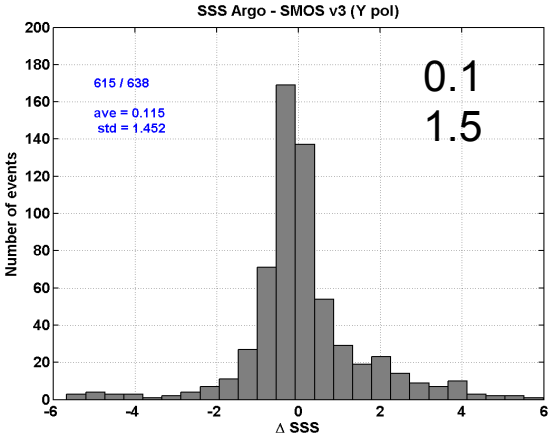
Preliminary SMOS SSS validation

Differences with ARGO buoys observations (1060 profiles)
One week of data, March 2010
Simplified SSS linear retrieval, X and Y pol separately





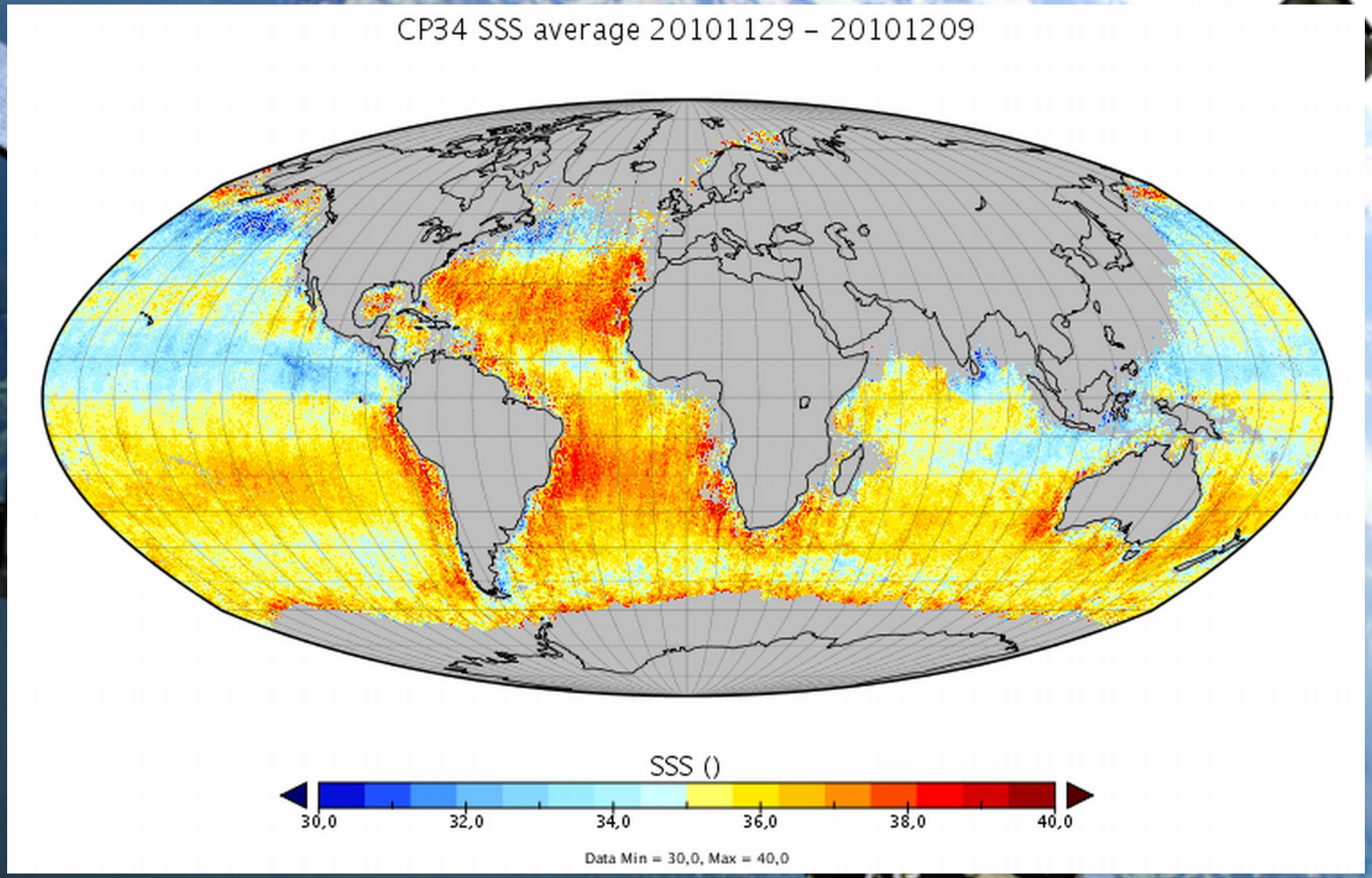




by J. Gourrion, J. Ballabrera
SMOS-BEC, Barcelona

SMOS SSS status summary

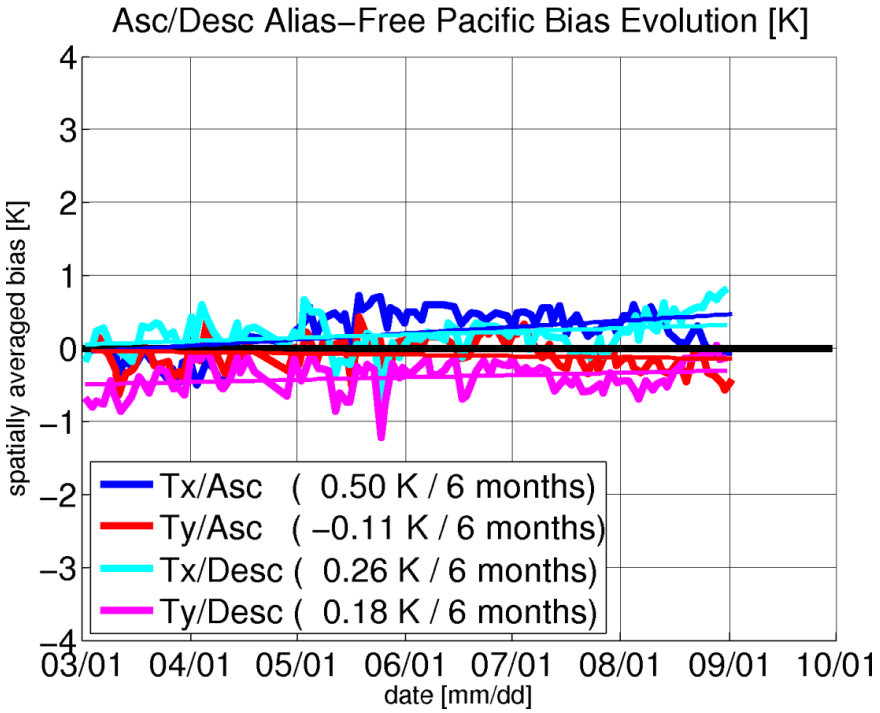
- Still solving issues at L1 and L2
  - Receivers drift (modeling physical temperature)
  - Land-sea contamination
  - RFI detection and mitigation
  - Faraday correction, galactic noise, …
  - Roughness effect correction
- Comparing with in situ data is now helping to improve forward models
- Selected diagnostic sites for validation
  - **Including SPURS area**
- Further improvements expected in L2 processor
  - New version every 6 months
  - Reprocessing every 12 months

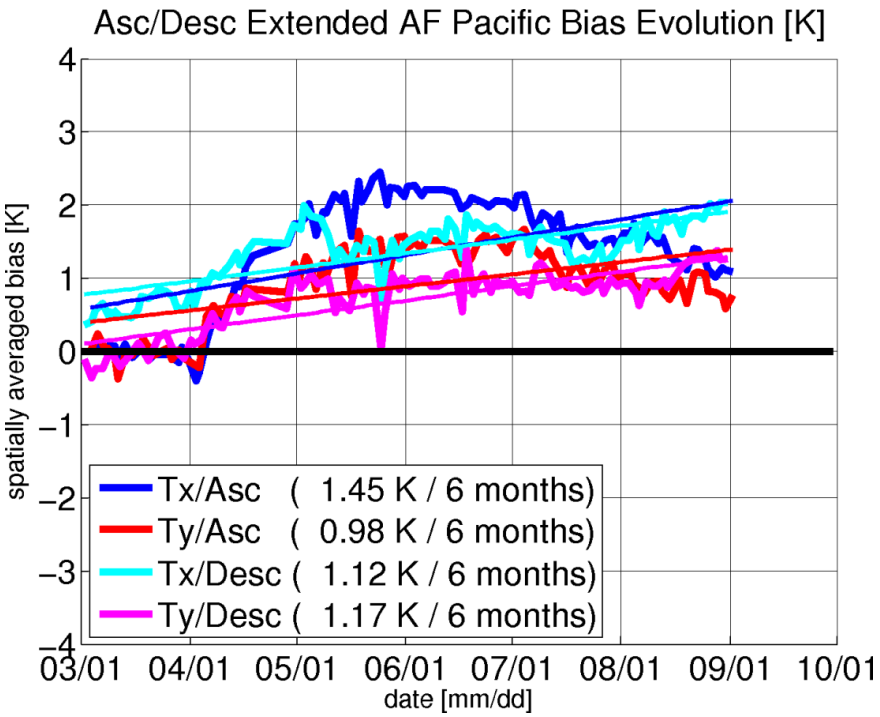


Thank you for your attention!

Main problems in SSS retrieval

- Radiometer receivers drift, linked to physical temperature drift
  - Seasonal behaviour
  - Impact of sun (heating) and galaxy (reflected radiation) position
  - Corrections under test for L1 processor





by J. Tenerelli, CLS, Brest